THE Cane Growers' QUARTERLY BULLETIN

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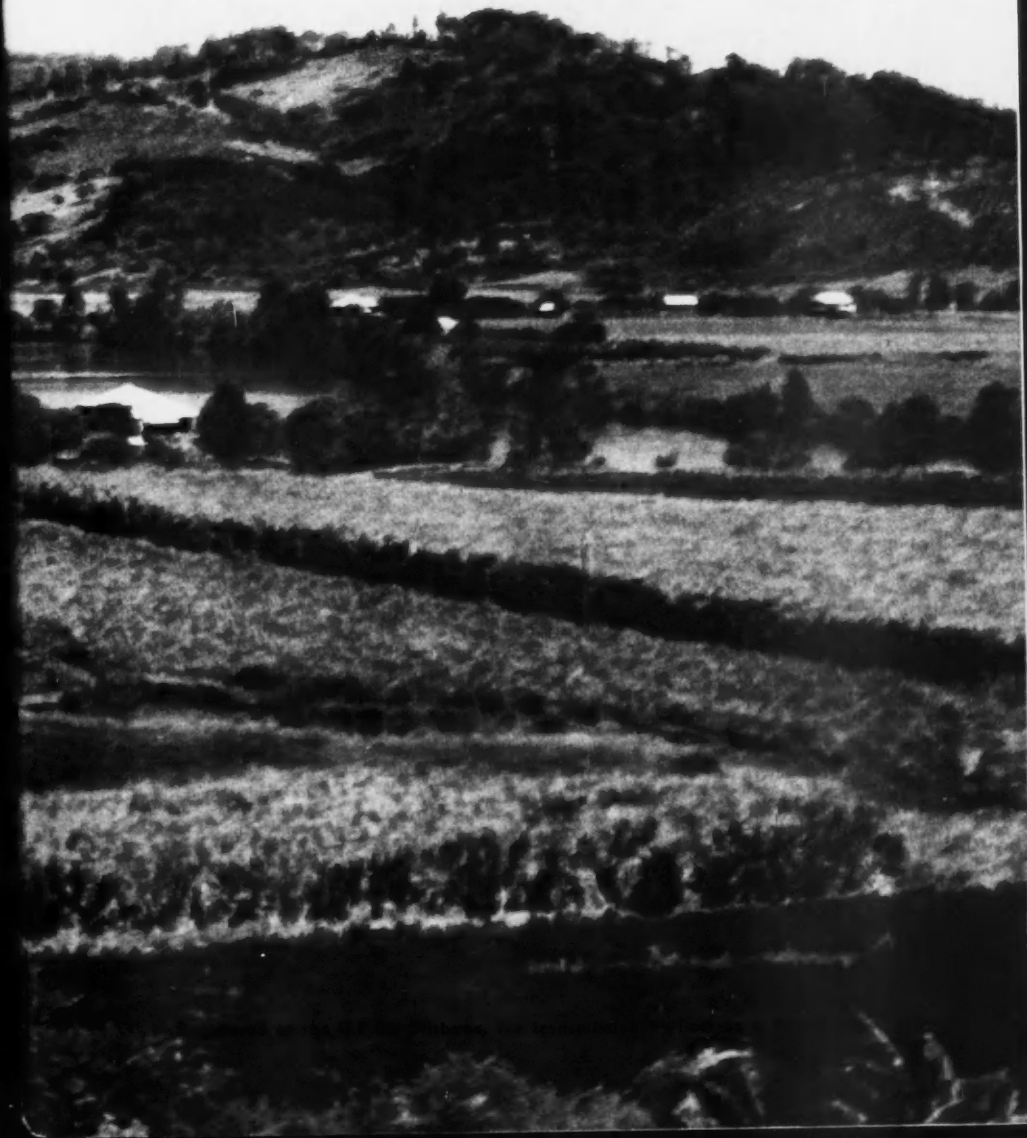

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BUREAU OF SUGAR EXPERIMENT STATIONS
BRISBANE

THE CANE GROWERS' QUARTERLY BULLETIN

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The

Cane Growers' Quarterly Bulletin

VOL. XX. 1 JULY, 1956 No. 1

Ratoon Stunting Disease in Brazil

F. M. VEIGA, Agronomist

(Estaçao Experimental de Campos, Brazil)

[We are very pleased to publish in our Quarterly Bulletin this contribution from Dr. Veiga of Brazil. This is the first evidence we have received of the presence of ratoon stunting disease in that important sugar producing country, and it confirms our previously expressed opinion that the disease is world wide in its distribution.—EDITOR.]

In order to co-operate on the determination of the world distribution of the sugar cane disease known as ratoon stunting disease, which was first mentioned as occurring in Queensland, in the variety Q.28, and considering that it was due to the Bureau of Sugar Experiment Stations, and to the work of its investigators, King and Steindl, that this important matter has received much concern from 1950 on, after the Seventh Congress of the International Society of Sugar Cane Technologists was held in Brisbane, we are glad to contribute some information in regard to the detection of the disease in this locality.

After the reading of the papers presented by King and Steindl, which were published in the pages of The Cane Growers' Bulletin, our attention was drawn to some canes which showed bad growth, specially in ratoons. Thus, in November, 1953, one of these canes was surprisingly bad in appearance, and this was H.32-8560, which had been imported in 1951, with the permission of The Hawaiian Sugar Planters' Association, for using exclusively for breeding purposes and not for commercial propagation.

Transmission of the disease by inoculation

We cut off some stalks from a stool of H.32-8560 which we supposed was diseased. With the extracted juice from these canes we tried to inoculate by pressure some other six varieties, which were CB.36-24, CB.41-76, CB. 45-3, CB.46-40, Co.419 and also the H.32-8560 ("CB" means "Campos-Brazil", and this is the prefix of the canes bred at this Experiment Station). We cut 22 cuttings each of the above mentioned varieties; then they were divided into two parcels of 11 cuttings, one of which was inoculated and the other remained as control. The time of inoculation was five minutes for all the varieties. After this, both inoculated and healthy cuttings were planted.

Plant Cane

During the plant crop cycle there was little difference, if any, between the two plots. In December, 1954, the cane rows were harvested and weighed separately.

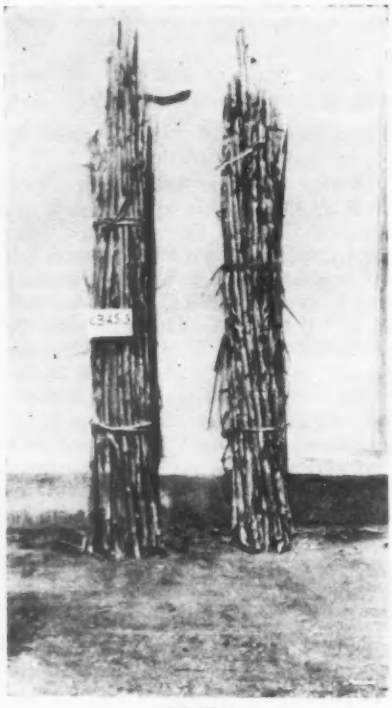
Plant Cane Harvest

Variety	Inoculated kg.	Healthy kg.
CB.36-24 ..	31	68
CB.41-76 ..	90	78
CB.45-3 ..	40	48
CB.46-40 ..	48	40
Co.419 ..	53	48
H.32-8560 ..	9	7

As can be seen by the results of the plant cane, they were not uniform, since some healthy canes weighed less than the diseased ones, as was the case for CB.41-76, CB.46-40, Co.419 and H.32-8560.

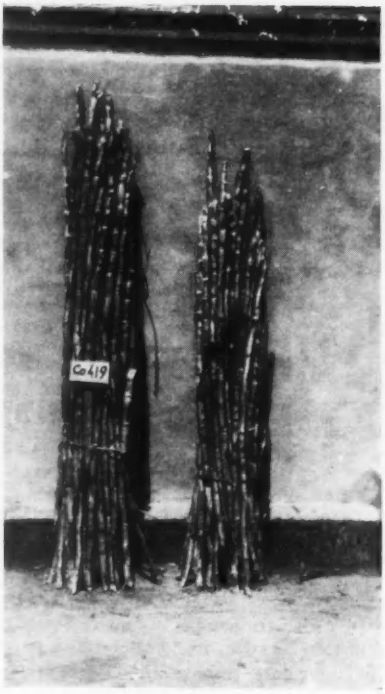
First Ratoon Results

As soon as the first ratoon started growth, a great difference was noted in favour of the healthy canes, and this difference increased as the canes developed. In October, 1955, the rows were again harvested and weighed separately.



CB. 45-3

Fig. 1—The variety least susceptible to ratoon and stunting disease, in CAMPOS, BRAZIL.



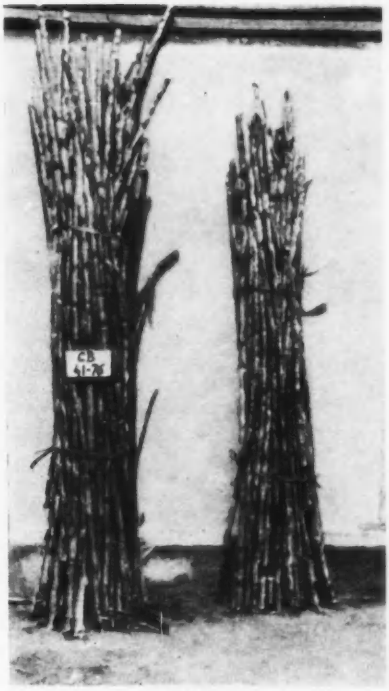
Co. 419

Fig. 2—This cane ranged second place, as to susceptibility.

First Ratoon Harvest

Variety	Inoculated kg.	Healthy kg.	Decrease in weight per cent.
CB.45-3	36	38	5.3
Co.419	48	62	22.3
CB.41-76	49	72	32.0
CB.46-40	12	39	69.2
CB.36-24	23	78	70.6
H.32-8560*	—	—	—

* This cane was completely destroyed and there were no millable sticks in the row.



CB. 41-76

Fig. 3—This cane was classified in third place.

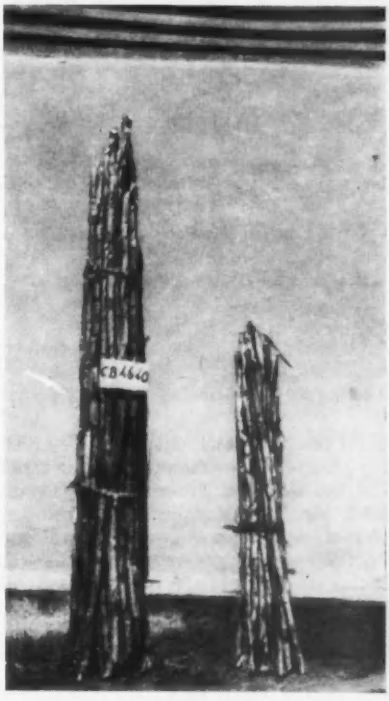
Conclusions

Despite that this is not an experiment, with replications, it is without doubt that the observation in the first ratoons leads to the conclusion that the inoculation with the diseased juice from H.32-8560 into healthy canes, reproduced the symptoms of the ratoon stunting disease. Not only the external signs, as the marked stunting of the diseased stools, were present, but also internal symptoms as referred by King and Steindl. When diseased stalks were split lengthwise they showed at the basal portion of the node reddened marks. It should be noted that during the severe drought spell experienced in the winter months this year the diseased canes showed more intense signs of the lack of soil moisture, specially CB.46-40. On the other hand, three varieties suffered less from the disease, and these were CB.45-3 (Co.290 x Co.331), Co.419 (POJ.2878 x Co.290) and CB.41-76 (POJ.2878 x Co.290); all, as we see, are descendant from Co.290. Wouldn't the *S. barberi* blood of that cane be responsible for the lesser susceptibility to this disease? CB.36-24, CB.46-40 and H.32-8560, which descend from POJ.2878 (a very susceptible variety) were the most affected.

Hot Water Treatment

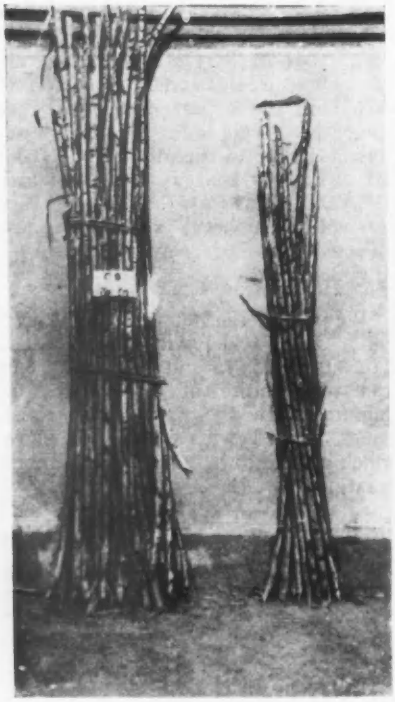
We started the hot water treatment on a small scale, with the varieties Co.290, POJ.2878 and NCo.310, using the temperature of 52° C. for 90 minutes. In the first ratoon those canes treated with hot water show much better growth than those without treatment.

Campos, November, 1955.



CB. 36-40

Fig. 4—This variety was badly affected by ratoon stunting disease.



CB. 36—24

Fig. 5—This variety was badly affected by ratoon stunting disease.

H. 32-8560

Fig. 6—This cane was completely destroyed and you cannot see any millable stick in the row.

NOTE—The cane bundles with identification cards are the healthy ones; those on the right are from inoculated rows.

Twenty-five years ago

At the Annual Field Day at Bundaberg Sugar Experiment Station in April last the Hon. the Treasurer for Queensland, Mr. E. J. Walsh, recalled the fact that some 25 years ago the central and northern growers were anticipating the early demise of the southern sugar industry. Growers and millers who did not experience the vicissitudes of the industry in those days must find it difficult to imagine that the best cane varieties then available could perform so poorly. Bundaberg and the other southern areas are so well equipped with good varieties to-day, and so free of major diseases and pests, that their position has never been more favourable. Rarely have these districts looked so well, and the crops more forward than in 1956.

Downy Mildew Disease Found at Bundaberg

By D. R. L. STEINDL

During April this year an unexplained outbreak of downy mildew disease was discovered on a farm in the South Kalkie area, Bundaberg. It appeared to have originated in a small ratoon block of Vesta, and from there had spread to adjacent fields of Vesta and P.O.J.2878, with odd stools in Q.50 and an experimental variety. In all, a total of 130 diseased stools have so far been destroyed.

Typical symptoms of the disease are the greenish-yellow streaks which run with the length of the leaf. They vary in width from 1/25 to 1/5 of an inch, and in length from a few inches to almost the full length of the leaf. As the streaks age they change to a darker yellow colour, then to mottled reddish brown, and finally to a dark red. The whole top eventually assumes a yellowish to rusty red appearance.

In warm, moist weather a fine white down develops on the under side of diseased leaves, and during the night myriads of tiny spores are produced. These spores may drift through the moist air for considerable distances, and if they fall on a susceptible plant, can set up a new infection.

As winter approaches, some stalks in a badly diseased stool elongate abnormally and the sparse, diseased top is pushed above the general level of the field to give what is known as the "jump-up" stage. At this stage leaves may also become shredded like teased rope.

Downy mildew was last recorded in the Bundaberg district in April, 1950. A small outbreak, similar to the present one, had been eliminated the previous year from the White Rock area near Cairns and it was believed that with the destruction of the infected Bundaberg crop this disease had been eradicated from Queensland cane fields.

Every effort is being made to eradicate the present outbreak, and regular inspections of the area are being made by members of the Cane Pest and Disease Control Board as well as Bureau staff. It is fortunate that a large proportion of varieties in the area is resistant to the disease, and that the only two susceptible approved varieties, viz., P.O.J.2878 and Vesta, are very limited in their distribution. C.P. 29/116, the major variety in the district, is virtually immune; N.Co.310 and Pindar are highly resistant; Q.47 is resistant; while Q.49, Q.50 and Q.55 all show a fair degree of resistance.

Fig. 7—Downy mildew on leaves of sugar cane.

This outbreak emphasizes once again the importance of keeping a constant watch for both old and new diseases, and of having information concerning the disease reactions of all commercial varieties.

Conference of Cane Pest and Disease Control Boards

The 18th Conference of Cane Pest and Disease Control Boards was held in the Shire Hall, Rankin Street, Innisfail, on Thursday, 5th April, under the Chairmanship of Mr. S. W. Dickson, Babinda. Some 53 delegates from 20 Boards ranging from Mossman to Nambour were present. Officers of the Bureau of Sugar Experiment Stations attended in an advisory capacity. On behalf of the Chairman of the Sugar Experiment Stations Board (Hon. H. H. Collins, M.L.A.), the Assistant Director, Mr. L. G. Vallance, welcomed the delegates and said that it was gratifying to see that most Boards were represented despite transport difficulties due to wet weather conditions. A hearty welcome was extended to the delegates by the Chairman of the Johnstone Shire Council, Councillor C. J. O'Brien, who expressed his pleasure that Innisfail was associated with this Conference which he considered was of considerable importance to the Sugar Industry generally.

All phases of disease and pest control were discussed and several papers dealing with the technical aspects of these subjects were read. The control of sugar cane diseases was dealt with by three papers contributed by Bureau officers. The Senior Plant Breeder, Mr. J. H. Buzacott. of the Northern Sugar Experiment Station, in a paper on new varieties and disease, stressed the importance of the work of the Boards in enabling somewhat susceptible, but otherwise desirable, new canes to be used as commercial varieties. A lengthy discussion on ratoon stunting disease was concerned with the techniques and results of the hot-water treatment of cane setts prior to planting. Mr.

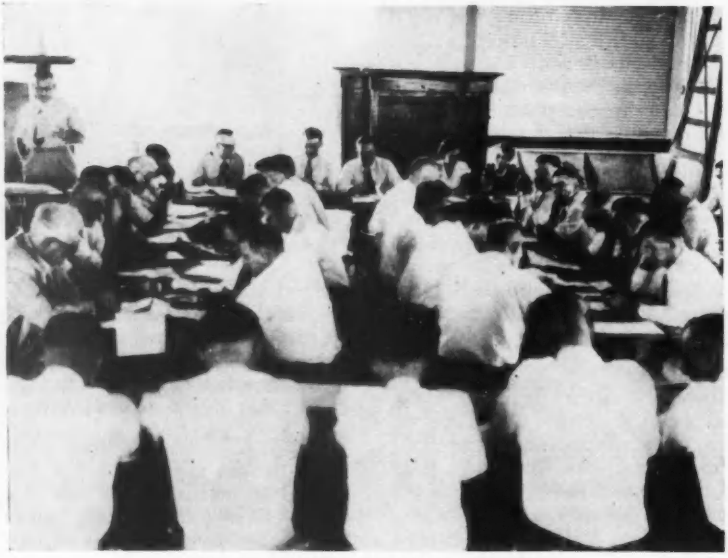


Fig. 8—During a session of the Conference.

D. R. L. Steindl, Senior Pathologist, outlined the results of a series of time-temperature combinations on germination and pointed out that, although no definite conclusions regarding control of the disease could be reached from this series of trials, it was anticipated that the ratoon crops would yield useful information in this connection. Mr. G. Wilson, Senior Entomologist, who had tested the hot-water treatment plants belonging to many Boards, summarised his observations on tank temperatures, sett containers and water circulation.

Mr. Wilson also presented a paper on the greyback cane grub and its control, in which he detailed the results of experiments carried out with benzene-hexachloride in the South Johnstone area since 1953. Those revealed that small fluctuating populations of grubs were likely to occur in canelands adjacent to grassland and natural rain forest. For that reason, he pointed out, control with insecticides would have to be maintained. A single adequate application of BHC to the plant crop had proved equally as effective as the same quantity divided between the plant and first ratoon crop.

Mr. B. E. Hitchcock, Assistant Entomologist, drew attention to a somewhat unusual pest which is found attached to cane roots in large numbers; because of their close similarity to pearls, these insects are commonly referred to as "earth pearls". Localised damage has been detected in the Bundaberg and Mackay districts but they have been found as far north as Deeral. Life history studies and control measures against this pest are in progress.

Fig. 9—Delegates examining the Giant Sensitive Weed on an Innisfail cane farm.

Nematode damage to cane roots in the Bundaberg district was reported by Mr. N. McD. Smith, Senior Adviser in Cane Culture, who described the characteristic clubbing and stunting which follows the attack on the sandy soils. The resistance of the variety Co.290 was commented on and a rotation with Crotalaria, sudan grass, sorghum or peanuts was recommended.

A topical paper on phosphorus rat baiting in the Babinda area was

presented by Mr. M. L. Nielson. His figures on cost of manufacture showed that raw linseed oil could be substituted for tallow, and AB syrup for golden syrup, without any loss of attractiveness to rats, and at a saving of approximately 27 per cent. in the total cost of an average campaign. Some discussion followed on the efficacy of the packeted thallium-coated wheat baits, and it was generally agreed that the present strength of 1 : 300 was quite satisfactory.

Upon receipt of an invitation from the Burdekin Cane Pest and Disease Control Boards, it was decided to hold next year's Conference at Ayr. At the termination of the proceedings, Mr. L. G. Vallance expressed his thanks to the Chairman and to the local bodies who were responsible for the successful organisation of the Conference.

On the Friday following the Conference the visiting delegates were taken on a tour of canefields in the Innisfail and Babinda districts, where items of interest such as experimental plots and varietal trials were pointed out.

Hot-Water Treatment is Not a Cure-All

C. G. HUGHES AND S. O. SKINNER

Questions often put to Bureau and Cane Pest and Disease Control Board officers indicate that some cane farmers are under the impression that the hot-water treatment of plants for the control of ratoon stunting disease will eliminate *all* diseases from the subsequent crop, and even from crops replanted from progeny of treated material. Such an idea is quite erroneous since so many of the diseases which may affect sugar cane are caused by infection in the established stool, and pre-planting treatment of the setts can have no effect on them. The fungi which cause the various leaf spots and stripes such as yellow spot, ring spot, eye spot and brown stripe, develop to some degree in all crops of cane quite independently of whether the planting material or the previous crop showed the disease. In a similar category is red stripe or top rot, both of which symptoms are a result of infection by the same soil-borne bacterium. The development of red rot in Queensland cane fields is likewise independent of the condition of the plants used, although of course no farmer in his right mind would think of planting setts infected with that disease.

The position with regard to chlorotic streak is somewhat different in that a heat treatment—actually much less than that required against ratoon stunting disease—is effective in curing the disease in infected setts, but the young stools are likely to pick up the disease within a few months in certain localities. Where the infection comes from is not clear at the moment but Bureau and overseas pathologists are studying the problem.

Heat treatment to the limit the setts will endure and survive will not effect a cure in setts diseased with mosaic, leaf scald, Fiji, sclerophthora and dwarf.

Experiment Station Damage

The March cyclone did considerable damage to our Northern Experiment Station at Meringa. The large seedling glasshouse suffered irreparable damage and will have to be rebuilt. The roof was removed from the manager's residence; many of the flowering trees, which enhanced the Station's appearance, were blown down, and damage was done to other buildings. A garage was completely demolished leaving the garaged vehicle without a scratch. Unfortunately the damage to seedling selection trials was serious and much of the variety work will be set back at least twelve months.

The Varietal Factor in Cyclone Damage*

By NORMAN J. KING

South Queensland cane growers are not so vitally interested in the effects of cyclonic winds on cane crops as are the growers in the central and northern districts, but there are reasons for speaking to you on this subject on this occasion. Firstly, strong winds do, on occasions, cause serious lodging of South Queensland crops and we should have some understanding of what damage might occur; secondly, we should have some foreknowledge of the behaviour of newer cane varieties towards wind before they are grown on large acreages.

The March cyclone in North Queensland this year, although disastrous to many farmers, did serve one beneficial purpose in allowing an assessment of the variety factor in cyclone damage. You have all read or heard of the serious losses which occurred in Pindar crops which were in many cases completely decapitated. But you may not have heard of the varying degrees of resistance to breakage exhibited by the other commercial canes.

The full story of Pindar losses is not yet known and will probably be never assessed with accuracy. Entire fields lost all tops, the breakage occurring just below the growing point. The variety Comus was also severely broken and some other canes showed stalk snapping in varying degrees. Badila, which is well known as a soft cane, lodged easily but did not break and the losses will, for that reason, be less severe. But it was a very noticeable feature of the cyclone that Q.57, Q.59 and Q.44 showed a high resistance to breakage even though the wind was strong enough to tear the leaf blades away from the midribs. Vidar also stood up well to the cyclone, but Q.64, Castor and Luna were quite susceptible to breakage. Q.50, which has attained some prominence in the Cairns area, withstood the blow remarkably well, although some stalks were snapped off at ground level in certain localities.

You might consider that the varying damage to cane varieties was more a matter of where the blocks were in relation to the cyclone, but a careful survey of the districts indicates that there is a well developed resistance factor in some canes. In one specific case a field of cane had been planted with alternating rows of Pindar and Q.50. The Pindar lost its tops and the Q.50, although badly blown about, escaped serious injury. Q.57, wherever it was growing from Ayr to Mossman, had superior resistance to the wind than adjoining varieties; it not only retained its tops but rarely lodged. Some of our more recent seedling productions which were selected for lodging resistance proved their capacity to withstand a cyclone.

But one of the outstanding examples of breakage resistance being an inherent characteristic of the variety and not a matter of location in relation to the wind, was on Meringa Station. There 28 varieties were growing in six-row plots in a block and the same 28 were also growing in single row plantings on the edge of the block. A survey after the cyclone showed that each variety experienced the same type of damage both in the six-row plot and in the outer single row. The second interesting point was that the range of breakage was from nil in some varieties to 100 per cent. in others.

And what does this tell us? It indicates quite definitely that resistance to breakage under strong wind conditions is a characteristic of the variety. It shows that it is possible to breed and select canes with breakage resistance. And it also warns us of the inadvisability of growing in large quantities a variety which is easily broken by wind.

* An address on the occasion of Field Day at the Bundaberg Sugar Experiment Station.

Just a year ago, in a paper read at the Technologist's Conference, I discussed cane varieties as a solution to a harvesting problem and attempted to demonstrate that an anti-lodging cane could be more profitable to grow even if it was of lower yielding capacity.

The cyclone damage highlights that contention. Certain varieties have shown their lodging and breakage resistance; some have shown their susceptibility. There is little question this year as to which will be the more profitable to the farmer concerned. Anti-lodging and anti-breakage are apparently factors which are inherent in a cane variety. Little is known as to whether these factors are dominant ones and whether they can be passed on to their progeny, but even if not it should not be a difficult matter to devise a test for new seedling canes which will indicate their resistance to breakage.

I have been using the terms lodging and breakage in relation to cyclone effects, but we should keep clearly in our minds that they are two different forms of damage. Lodging of cane crops is serious enough since it usually results in lower sugar content, some damage to the root system, rat damage, suckering and higher harvesting costs. But with stalk breakage such as happened this year the effects are not so clear cut. A cane stalk which has had the top broken off below the growing point cannot make any further stalk growth; further, by reason of having lost its leaves it cannot ripen any further since it is the chlorophyll in the leaves which makes the sugar for storage in the stalk; thirdly, as side shoots develop from the buds some of the sugar already in the stalk is used as energy to produce the side shoots. However, as the side shoots make green leaves they will begin to function as sugar producers and the stalk may then improve in c.c.s. During this period there is the possibility of rots, such as red rot, entering the broken top or through damaged buds or rind and this could cause deterioration. So the effect of stalk breakage is not clear cut. Even if the stalk does make enough sugar to justify harvesting for the mill the attached side shoots will cause harvesting difficulties.

The climatic conditions between the cyclone damage and the time of harvesting will, to some extent, decide the fate of the broken cane. Under some conditions the crop will, doubtless, be fit for milling but, in other cases, deterioration caused by certain factors may make it uneconomic to harvest. The best means of assessing its value is progressive small mill testing, by which means the trend of ripening may be followed.

One of the points I have attempted to make in this talk is that resistance to stalk breakage and resistance to lodging are inherent characters of a cane variety. They are characters which are bred into a cane and which are, to a large degree, independent of the environment in which the cane is growing. This knowledge allows a selection of varieties to be made for the cyclone belt. If a grower knows that a certain cane will not withstand strong winds without breakage, then he can plant those canes which will withstand them.

Breeding canes for cyclone resistance may sound like a difficult problem, but it is probably no more difficult than breeding for disease resistance and that line of work has been very successful in Queensland.

Mechanical Harvesting of Cane in the Bundaberg District

By H. G. KNUST

The search for a suitable machine with which the small cane grower can harvest his crop economically, has been stepped up during recent years for various reasons. Since those described by the writer[1], four machines have been made and worked with varying degrees of success but none has worked satisfactorily under all field conditions.

A machine (Fig. 10) tried on a Moore Park farm during the 1955 crushing season did not embrace any new feature but an endeavour was made to combine desirable features of machines in use. The circular disc cutting device used is also in use on the Toft, Parry and Bonel machines, the antennae-like cane-gathering and bundling devices are also in use on the Scott machine.

The cutting and gathering assemblies are mounted on a tubular frame, the rear end of which pivots on the fixed points on which three-point linkage implements pivot. This frame, which extends beyond the front of the tractor, is raised and lowered by a flexible steel rope, around pulleys, and attached to the front of the main frame, and an extension arm bolted to the lift arms. The cane-gathering device hinges on the front of the main frame and is similarly operated. The left side lift arm operates the cane-gathering device while the right side lift arm is used for raising and

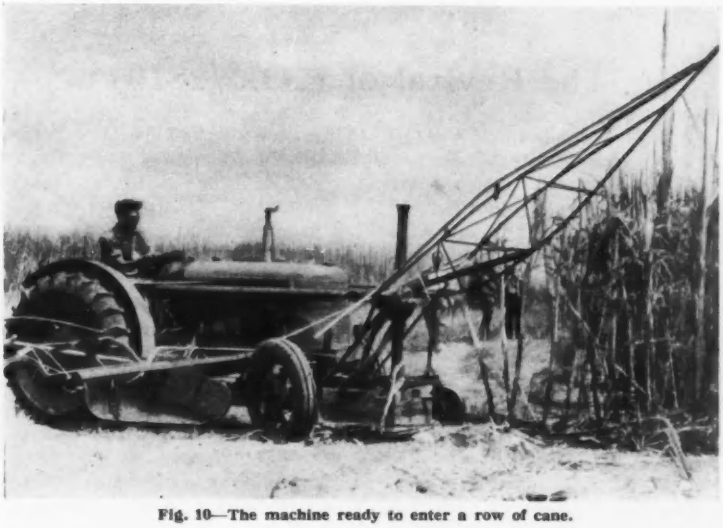


Fig. 10—The machine ready to enter a row of cane.

lowering the main frame. An adjustable depth wheel mounted on the near side front of the frame controls ground cutting height. The cutting disc is driven from the power take off by an enclosed chain drive through a tailshaft and universals to a differential (Fig. 11). The bundling device, mounted on the rear off side of the tractor is a simple rotating, equidistant four pronged arrangement, which is locked in position while the cane is being gathered and released, usually when cane sufficient for a reasonable bundle has been gathered. No attempt has been made to top the cane mechanically and this is done manually after the cane is bundled.

This machine satisfactorily cut and bundled cane when working on the lee side of a field, but when working on the windward side the cane, after being cut at the bottom, tended to scatter, causing untidy bundles and choking.

Reference

1. Cane Growers' Quarterly Bulletin, January, 1950, pp. 115-122.

Fig. 11—Illustrating the drive to the cutting disc.

The Revival of P.O.J. 2878?

In the late nineteen thirties P.O.J. 2878 was responsible for the southern districts achieving a place in the sugar industry of Queensland from which it is unlikely to recede. The productive capacity of this cane and its resistance to gumming disease increased yields markedly; but, in addition, its ability to produce standover crops with high sugar content early in the season enhanced its value to farmers. High tonnage crops which could be cut at the start of crushing and give a return of 13 to 14 c.c.s. were commonplace in those years.

The spread of Fiji and downy mildew diseases in the susceptible P.O.J.2878, and the sudden increase in incidence of these two serious diseases, made necessary the restriction of plantings of this valuable cane. With the control and elimination of both downy mildew and Fiji, and the later control measures for ratoon stunting disease, it was possible to reintroduce clean stocks of the cane and to permit its propagation on suitable lands.

During the recent Sugar Technologists Conference in Bundaberg it was gratifying to see the variety once more growing in several blocks where it proved so valuable in the past. Let us hope that its value for early harvesting will result in a more favourable quality ratio for the southern mill areas.

—N.J.K.

Chemical Weed Control in Mauritius

By J. H. BUZACOTT

In Mauritius there are few tractors and many of the soils are very rocky. The normal method of weed control practised in cane crops is hand hoeing and, in the case of larger grasses, hand-pulling. In the rocky soil types hand hoeing is most difficult and naturally considerable interest has been shown in the use of chemical sprays. Experimental work has been carried out using the same types of sprays as in Australia, that is to say various formulations of 2,4-D, its amines and esters, TCA, 2,4,5-T, sodium pentachlorphenate, MCPA, etc. Results in Mauritius have been very similar to those obtained in Australia. Certain weeds are found to resist most sprays, but if reasonable care is taken the chemical method can be of great value, particularly as hand labour in Mauritius is relatively cheap and can be used to assist if chemical control has not been entirely successful.

At Rose Belle plantation the writer had an opportunity of seeing the chemical method as practised on a plantation scale. The blocks being sprayed were very rocky and huge mounds of rocks which had been cleared from the field were stacked at intervals throughout it. Spraying is all carried out by hand labour (Fig. 12). The operators carry a brass cylinder fitted with a six-head spray nozzle (Fig. 13). The brass containers are filled under pressure from a tractor-drawn tank which carries enough solution to treat some 20 acres of cane land. This main tank is fitted with a small Drake and Fletcher pump to which the brass containers are connected whilst filling (Fig. 14). Six spray operators were used in the demonstration and the refilling of the tanks took only a matter of a few minutes each. Much of the apparatus used was manufactured in the Rose Belle mill workshop.

Fig. 12—Spraying a field of young plant cane with weedicides, Rose Belle Plantation, Mauritius.

The weedicide used in the demonstration at Rose Belle was MCPA, which was applied at the rate of 3½ to 4 lb. of active ingredient per acre; this amount is dissolved in 50 gallons of water. The spray was applied at the pre-emergence period and its effectiveness was demonstrated by an inspection of the well-grown cane on other blocks which were sprayed in the previous year and which were very weed-free. Weed growth is normally very rapid at Rose Belle, which is in a high rainfall district.

An interesting method used to reduce the incidence of weeds and perennial grasses was used in fields which are to be replanted. It is standard practice in Mauritius to grow up to eight or nine ratoon crops, then plough out and replant. After harvesting the last crop the trash is burnt off and, when the perennial grasses develop, the field is spot sprayed with TCA at the rate of 100 to 125 lbs. TCA in 200 gallons of water per acre. This concentration effects a 100 per cent. kill of couch grass and sometimes sodium pentachlorphenate is added to give a quicker kill of the top-growth. However, this chemical is unnecessary as it does not affect the ultimate kill of the grass. Spraying has to be done some two months before planting. This pre-planting weedicide application is a valuable asset in the control of perennial grasses. It is of course peculiarly applicable in Mauritius where legume cover crops are little used during the fallow period.

Fig. 13—Type of spray used for weedicides.

Fig. 14—Pump and supply tank used to fill knapsacks under pressure.

Fig. 15—Demonstration of elephant ploughing.

Fig. 16—Resistance of S. *officinarum* x S. *robustum* seedlings to the March, 1956, cyclone.

Fig. 17—Decapitated Pindar on a Bartle Frere farm, Babinda District.

Fig. 18—Cyclone damage in alternate rows of Pindar and Q.50 near Meringa—Cairns area.

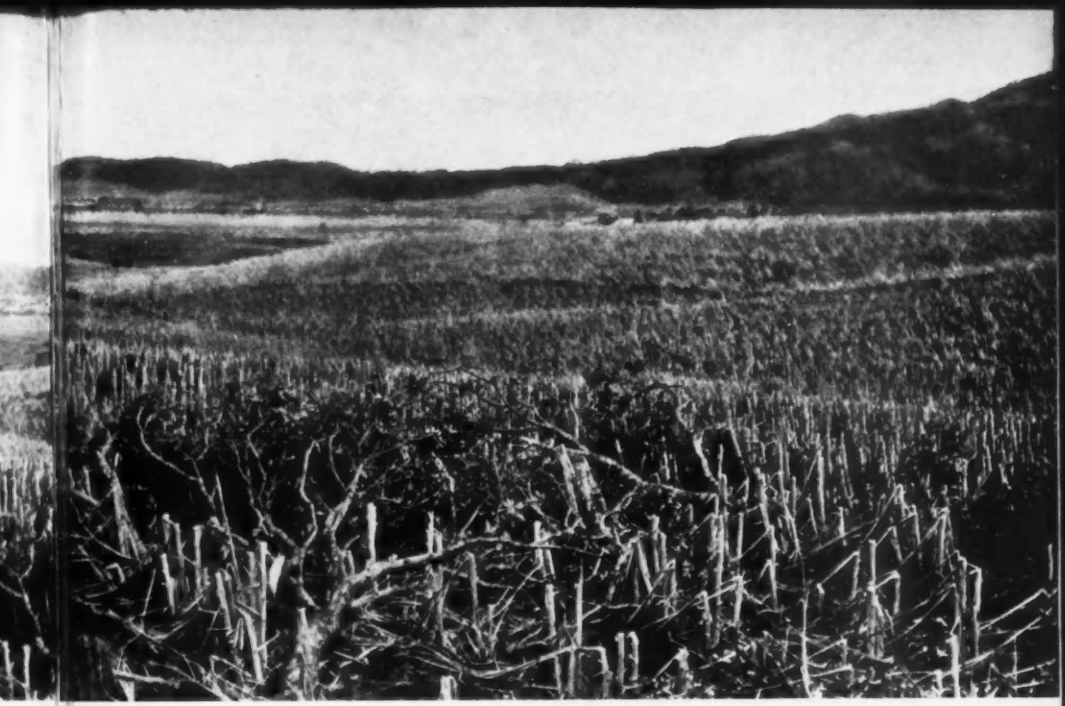
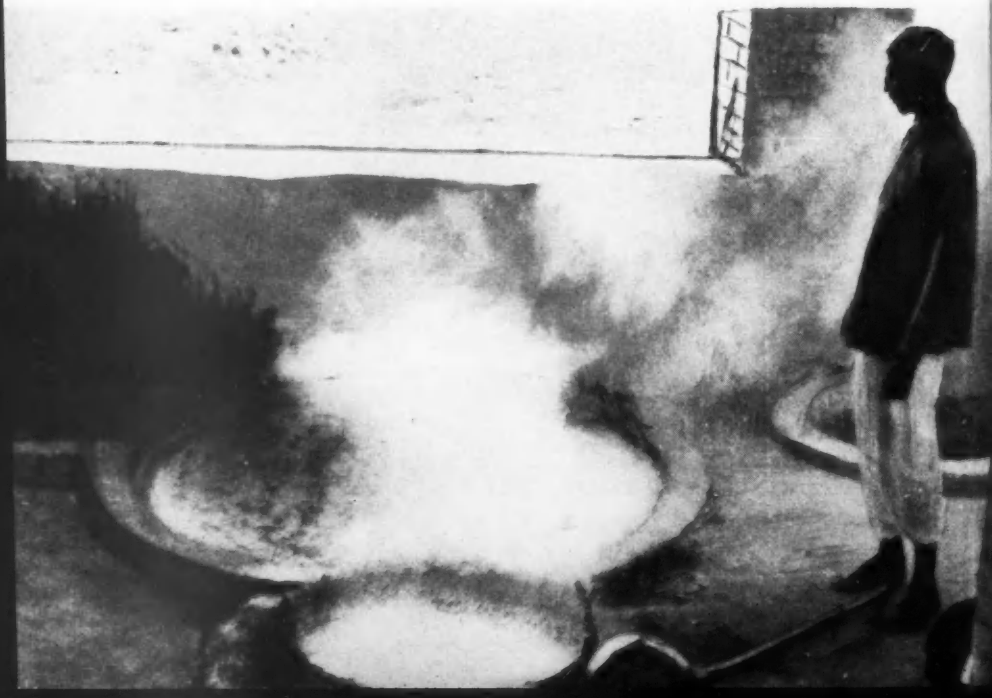


Fig. 19—Another example of cyclone damaged Pindar. All tops have been broken off by the wind.

Fig. 20—A farm home at Cucania after the cyclone. Note stripped palms and decapitated Pindar.

Fig. 21—Ox-cart delivery to a small Indian sugar mill.
Delivering cane to an open-pan sugar and gur factory at Lucknow

Fig. 22—Open pans in a small Indian sugar mill making gur and khandsari.



Recent Visitors to the Bureau

By C. G. HUGHES

Australia, and particularly Queensland, is "out on a limb", as the saying goes, regarding visitors. They have to make a special trip to see us, for this State is not an intermediate stopping place on the way to somewhere else. It is all the more gratifying therefore to find that technological visitors do come frequently to look at our industry. The two most recent include an entomologist from the British Colony of North Borneo and an agriculturist from India.

Mr. Chan Kwai Shang, or Mr. K. S. Chan, to put his names in the familiar western order, is on the staff of the North Borneo Department of Agriculture. His headquarters are at Jesselton but his interest in such diverse crops as coconuts, rice and sugar cane means that he is frequently on the move. There are very few corners of the 29,000 square mile colony which he does not know, and the agricultural well-being of the 350,000 inhabitants is dependent largely on the efforts of Mr. Chan and his co-workers.

Fig. 23—Mr. D. Ramanujam in the cane at the pathology farm.

Fig. 24—Mr. D. R. L. Steindl shows Mr. K. S. Chan ratoon stunting disease at the pathology farm.

Mr. Chan came from Canton in China in 1937 to North Borneo and has been there ever since. His visit to Australia is his first here, and he is spending approximately six months in the eastern States with a trip for two weeks to investigate agriculture in New Guinea. He comes as a Senior Fellow under the Colombo Plan.

Mr. D. Ramanujam is agricultural adviser to Begg, Sutherland and Co. Ltd. of Marhourah, India. The firm owns ten mills and also operates several plantations. Mr. Ramanujam is engaged on a study tour which will eventually take him to practically every cane producing country. While in Queensland he was given every opportunity to study the industry here and made many contacts while attending the 1956 Conference of the Queensland Society of Sugar Cane Technologists held at Bundaberg during April.

Round Fence Posts: Preservative Oil Treatment

A recent C.S.I.R.O. Leaflet (No. 12, 1955) on the preservative treatment of round fence posts is of such obvious importance to farmers in the sugar areas that all possible publicity should be given to it. Traditionally, farm fences are made of posts split from mature trees of hard, durable timber. Supplies are now becoming acutely short in many districts and it is welcome news that round posts with sapwood still intact may be cheaply treated with creosote, or pentachlorphenol, to give a life and prolonged strength even better than hardwood heart timber. The following extracts are printed here to indicate the scope of the Leaflet; further information and a copy of the Leaflet may be obtained from the Division of Forest Products, C.S.I.R.O., 69-77 Yarra Bank Road, South Melbourne, S.C.4, Victoria.

"In some countries the preservative treatment of timbers which would otherwise fail rapidly from decay or insect attack is a well-established means of overcoming the problem of shortage of naturally durable fence post timbers. Experience with millions of round posts treated with reliable preservatives shows a life of 20 to 30 years or more, irrespective of the timber used. In 1930 tests were commenced in Western Australia by the Division of Forest Products to see what happened in Australia. There is now no doubt that the good results being obtained in other countries can be repeated regularly in Australia.

Small round posts given proper treatment will last as long as split posts of naturally durable timbers, and will provide a strong fence.

The treatment will give good penetration of the sapwood, and if the sapwood of a round post is well saturated with a preservative it becomes the most durable part of the post. It forms, in fact, a protective barrier completely surrounding the untreated heartwood, the natural durability of which is not then important. With most timbers this barrier of preservative-saturated sapwood is half an inch or more in thickness, and provides a reservoir of preservative necessary for a life of 30 years or more. The size of posts will depend on the stock the fence must hold, but of 25 million fence posts treated in the U.S.A. each year, the majority are only 3 to 5 inches in diameter, and it has been found that even the smallest of these make a substantial fence.

It is true that in a new fence small round posts are not as strong as the larger split posts commonly used. However, split posts are usually larger and stronger than is necessary in the first half of their life. This oversize provides the splitter with some margin and permits considerable decay or termite attack to occur before the post is weakened too much.

With round treated posts a similar safety margin is not so important, as they last many years before deterioration commences and thus retain their full strength for almost all their service life. Further, the outer layers of a post impart most of its strength, and it is these layers which are treated and made more durable.

Small round posts have other advantages over split posts: they are lighter to handle and easier to install, more can be carted per load, they are cheaper and usually easier to produce, and they can be sharpened and driven into most wet soils, thus avoiding post-hole digging.

The oil preservatives recommended are readily available in the main cities of most States, and are reasonable in price. The equipment is simple. Handling gear is not essential, but can be used to advantage.

The three treatments described in detail may be explained briefly as follows:

Cold Soaking consists simply of soaking the dry, barked posts in a bath of cold preservative for several days and then draining them.

Low-pressure soaking is an accelerated version of cold soaking using a treating drum with a sealing lid, and an elevated supply tank to give a small head of pressure.

Hot and cold bath treatment consists of heating the posts in the preservative and then allowing them to cool while still in the preservative. As in the other methods, the posts are drained after treatment.

The preservative oils recommended are much safer to handle than some poisons commonly used on the farm.

With some people, however, excessive contact with the skin may cause irritation, and the use of heavy, loose-fitting, plastic gloves is recommended for handling the treated posts. These last longer than rubber gloves, and can be obtained with a rough surface which gives a good grip. A plastic apron to protect clothing is also recommended. A barrier cream applied to the hands before commencing work is well worth using if gloves are not worn.

If the preservative is splashed into the eyes it causes a very painful irritation, and should be washed out as quickly as possible with water.

As the preservative oils are inflammable, care must be taken, if they are being heated, to prevent splashing or boiling over on to the fire. As water mixed with the preservative will cause foaming upon heating, every effort should be made to keep rain or other water from getting into the preservative or the treating tanks. Tanks should be covered to prevent accidents with children or stock.

Undoubtedly a fence post soon after treatment with an oily preservative will catch fire more readily than an untreated post. However, when exposed to the sun and rain the surface of the post does not remain oily for long. Usually the fire risk falls rapidly during the first year and thereafter is often lower than for an untreated post. Practical proof of this has been obtained in field tests in Australia, where pine poles treated with creosote oil were not affected by a grass fire which seriously damaged many untreated eucalypt poles interspersed in the same pole line. The reason is that the weathering and softening of the surface of the untreated timber make it more inflammable.

Creosote oil is probably the most reliable and widely used of all preservatives. It is obtained from coal tar and can be bought in 44-gallon drums direct from tar distillers or from some gas companies in the larger cities of Queensland, New South Wales, Victoria and Western Australia. As creosote oil varies in quality, it should be ordered to comply with Australian Standard Specification K.55 and to be as thin or fluid as possible.

Pentachlorphenol, popularly known as "penta" is a greyish, flaky chemical which does not dissolve in water but can be dissolved slowly in most mineral oils. When used correctly it is an excellent wood preservative. It is being used increasingly in America and many other countries for treatment of fence posts, wooden poles, and exposed structural timbers.

An adequate and even absorption of preservative is essential, but an unnecessarily high absorption will mean uneconomical treatment. It is necessary, therefore, to know the quantity of preservative required for successful treatment, not only so that a sufficient supply can be ordered, but also so that the amount absorbed during the first few treatments can be checked.

Preparation for treatment must be commenced several months ahead of actual treatments. To dry the sapwood of barked posts thoroughly will take at least three months, and possibly six months or longer, according to locality and time of year. Further, much labour can be saved by cutting the posts at the time of year when barking is easiest. Plans for treatment should take this into consideration as well as the fact that, although treatment can be carried out at any time of year provided the posts are dry, hot weather is preferable, particularly for soak treatments, as the preservative oil is then thinner, penetrates more easily, and drains off better, leaving a cleaner post."

The Leaflet goes on to describe the best practices to be followed in drying the posts before treatment, in planning the treatment plant and in carrying out the recommended treatments. It would appear that the cold soaking would be most suitable for Queensland cane farmers: the choice between creosote and the pentachlorphenol, which is used as a five per cent. solution in a mineral oil at least as heavy as diesel fuel oil, would depend on relative landed costs of each preservative on the farm.

—C.G.H.

Mr. C. G. Hughes' Report not for General Distribution

Bureau Senior Pathologist, Mr. C. G. Hughes, last year visited plant pathological centres in the United Kingdom, Continental Europe, Canada and the United States of America. He spent four and a half months abroad and visited more than 40 research, applied pathology and commercial establishments. Recent contributions by Mr. Hughes to the "Quarterly Bulletin" dealing with overseas items of interest to local canegrowers have prompted some of them to ask whether the Bureau will be publishing a report on his visit. It will be recalled that the Senior Plant Breeder, Mr. J. H. Buzacott, prepared a report, which was later widely distributed, following his visit to the Philippine Islands, India, Mauritius and South Africa early in 1955. However, Mr. Hughes' report was not on such a wide basis as Mr. Buzacott's and a perusal of the manuscript led the Sugar Experiment Stations Board to decide not to incur the expense (some £600-£800) of printing it. It is a highly specialized report prepared by a pathologist essentially for pathologists and its distribution in mimeographed form with photographs pasted in, is to be limited to Bureau personnel only.

—N.J.K.

Varietal Trials — 1954 and 1955 Seasons

By G. C. BIESKE

E. P. & O. R. ANDREWS, No. 2, Wyanbeel, Mossman.

Soil type: Grey clay loam.
Age of crop: 12 months.
Nature of crop: First Ratoon.
Harvested: July, 1954.

SUMMARY OF CROP YIELDS

Variety	Plant crop		First ratoon crop		Summary	
	Cane per acre	c.c.s. in cane	Cane per acre	c.c.s. in cane	Total cane per acre	Total sugar per acre
	Tons	Per cent.	Tons	Per cent.	Tons	Tons
Q.50	46.25	13.92	35.56	12.01	81.81	10.69
Q.44	45.90	16.97	34.05	15.08	79.95	12.92
Comus ..	43.80	16.14	29.94	15.49	73.74	11.70
Pindar ..	42.20	16.97	35.98	15.50	78.18	12.74
Pompey ..	41.70	14.63	30.72	13.59	72.42	10.27
S.J.4 ..	41.65	15.15	27.24	13.73	68.89	10.05

DISCUSSION.

Good growing conditions prevailed throughout the ratoon crop of this trial and all varieties ratooned quickly except Pompey, which was rather slow in coming away. Comus produced a somewhat gappy stand. At the time of harvest Comus and Pompey had lodged while the remaining varieties were sprawled.

An analysis of the first ratoon harvest, results indicated that Pindar and Q.44 were superior in terms of sugar per acre and should be the most suitable varieties on this soil type. Q.50, although performing well as regards cane per acre, had the lowest c.c.s. figures, and this may be partly due to the fact that this variety arrowed moderately heavily.

In the overall analysis Pindar and Q.44 are outstanding, having produced approximately two and a half tons of sugar per acre more than Q.50, Pompey and S.J.4.

L. RE, Syndicate, Mossman.

Soil type: Grey clay loam.
Age of crop: 10 months.
Nature of crop: First Ratoon.
Harvested: July, 1954.

SUMMARY OF CROP YIELDS

Variety	Plant crop		First ratoon crop		Summary	
	Cane per acre	c.c.s. in cane	Cane per acre	c.c.s. in cane	Total cane per acre	Total sugar per acre
	Tons	Per cent.	Tons	Per cent.	Tons	Tons
Q.50	44.45	17.19	34.54	14.30	78.99	12.58
Pindar ..	43.55	17.59	39.74	15.72	83.29	13.91
Q.44	38.80	17.37	33.19	15.28	71.99	11.81
Q.57	37.70	17.77	33.29	16.36	70.99	12.16
S.J.4 ..	34.95	16.94	27.74	15.18	62.69	10.12
Trojan ..	34.65	17.17	31.34	14.78	65.99	10.59

DISCUSSION, L. Re

Growth conditions during the first ratoon crop of this trial were favourable and all varieties ratooned quickly, particularly Q.57. Trojan was slower than the other varieties and during the early stages Trojan and S.J.4 were backward in growth.

Pindar was the outstanding variety in this trial and in the ratoon crop exceeded all others at the one per cent. level of significance in both cane and sugar per acre. In the total analysis Pindar produced nearly three and a half tons of sugar per acre more than S.J.4, the lowest yielding variety. The earliness of the ratoon harvest probably contributed to the low c.c.s. figure for Q.50, but on the whole this variety performed reasonably well. Attention is also drawn to Q.57, which had the best juice quality in both plant and ratoon crops, and the value of this cane for early harvesting may be seen from the first ratoon crop figures.

NORTHERN SUGAR EXPERIMENT STATION, Gordonvale, Block A.2.

Soil type: Brown to grey clay loam.
Age of crop: 12 months.
Nature of crop: First Ratoon.
Harvested: July, 1955.

SUMMARY OF CROP YIELDS

Variety	Plant crop		First ratoon crop		Summary	
	Cane per acre	c.c.s. in cane	Cane per acre	c.c.s. in cane	Total cane per acre	Total sugar per acre
	Tons	Per cent.	Tons	Per cent.	Tons	Tons
Co.475 ..	51.29	14.65	42.30	14.17	93.59	13.53
Pindar ..	46.26	14.16	33.14	12.61	79.40	10.72
J.238.. ..	36.74	12.54	25.39	12.28	62.13	7.74
J.204.. ..	36.02	12.91	23.60	12.02	59.62	7.48
J.301.. ..	35.10	11.59	25.30	10.74	60.40	6.78
J.330.. ..	35.08	11.75	22.76	11.25	57.84	6.68

DISCUSSION.

This trial was planted in June, 1953, and Co.475 and Pindar were the only varieties not hot-water treated prior to planting. Good germination occurred in the Co.475 and Pindar plots but, due to the cool weather and hot-water treatment, germination was very slow and patchy in the other varieties. The plant crop was harvested at 13 months and the crop analysis showed that Co.475 was significantly superior to the other varieties in both cane and sugar per acre. Pindar produced significant yields of cane and sugar above the J. seedlings.

In the ratoon crop, Co.475 came away very fast and established a good lead over all other varieties with the exception of Pindar. Throughout the crop, Co.475 maintained its lead and as in the plant crop was impressive in regard to vigour, stooling and erect growth. This variety did not arrow in the plant crop and very slight arrowing occurred in the ratoons.

The ratoon harvest results followed exactly the same pattern as for the plant crop and in the aggregate of the two crops the superiority of Co.475 in both cane and sugar production is very marked. Unfortunately, in South Queensland, Co.475 has been found to be highly susceptible to red rot disease and if it shows the same trend in North Queensland it is doubtful if the variety could be grown commercially.

C. JOHNSON, Highleigh.

Soil type: Grey-brown schist. **Nature of crop:** Plant.
Age of crop: 13½ months. **Harvested:** July, 1955.

SUMMARY OF CROP YIELDS

Variety	Cane per acre	c.c.s. in cane	Sugar per acre
	Tons	Per cent.	Tons
Thick Badila	44.55	13.12	5.85
Ayr Badila..	41.24	13.59	5.61
Innisfail Badila	40.77	13.86	5.64
Badila Seedling	40.72	13.67	5.56
Oba Badila	39.59	13.63	5.40

DISCUSSION.

This trial was set out in order to compare some of the various Badila types grown in North Queensland. Soil moisture and tilth were good at planting but the canes germinated slowly due to the cold weather conditions. Light supplying was necessary in all plots but no one Badila type germinated significantly better than the others. All types stooled well and produced even stands. In April, 1955, Oba Badila and Badila Seedling were sprawled to lodged whilst the other canes remained erect up to the time of harvest. Badila Seedling arrowed early and moderately, Oba Badila arrowed lightly, and the other types arrowed very sparsely and late.

Thick Badila exceeded the other types at the 5 per cent. level of significance in terms of cane per acre but had the lowest c.c.s. figure. There were no significant differences in sugar per acre between the various Badila types.

LOWER BURDEKIN SUGAR EXPERIMENT STATION, Ayr, Block B.1.

Soil type: Alluvial loam. **Nature of crop:** Plant.
Age of crop: 15 months. **Harvested:** October, 1954.

SUMMARY OF CROP YIELDS

Variety	Cane per acre	c.c.s. in cane	Sugar per acre
	Tons	Per cent.	Tons
Pindar	50.87	17.02	8.66
L.473	56.35	15.20	8.56
L.470	52.68	15.70	8.24
L.469	46.14	16.84	7.77
L.409	48.82	15.73	7.68
S.J.16	45.41	15.62	7.09

DISCUSSION.

The trial block was irrigated immediately after planting but the cool weather experienced at this time caused slow germination. However, reasonably good stands of cane developed in all plots and at harvest all varieties were erect. S.J.16 made slow early growth and this is reflected in the final yield of this variety. Slight damage occurred in the Pindar plots during a cyclone in February, 1954.

L.473 and L.470 exceeded the standard variety, Pindar, in cane per acre, but the position was reversed when assessed in terms of sugar production. In both cases, the differences between these varieties were not statistically significant because of the rather erratic yields obtained from some of the plots.

W. CANNAVAN, Home Hill.

Soil type: Grey-brown clay loam. **Nature of crop:** Second Ratoon.
Age of crop: 13 months. **Harvested:** August, 1955.

SUMMARY OF CROP YIELDS

Variety	Plant crop		First ratoon crop		Second ratoon crop		Summary	
	Cane per acre	c.c.s. in cane	Cane per acre	c.c.s. in cane	Cane per acre	c.c.s. in cane	Total cane per acre	Total sugar per acre
	Tons	Per cent.	Tons	Per cent.	Tons	Per cent.	Tons	Tons
Trojan ..	52.52	13.69	44.08	12.19	33.65	17.07	130.25	18.28
P.O.J.2961	51.14	13.92	40.96	12.03	27.97	15.94	120.07	16.52
Pindar ..	50.70	15.09	32.91	14.92	43.28	17.08	126.89	19.97
Q.57 ..	49.26	14.47	41.95	12.69	39.13	16.10	130.34	18.75
S.J.16 ..	46.94	14.53	30.53	12.28	22.43	17.28	99.90	14.45
Badila ..	37.75	14.75	33.35	11.70	24.36	17.00	95.46	13.64

The first ratoon crop, harvested at 11½ months, produced somewhat conflicting results in that Pindar suffered a drop in cane tonnage as a result of cyclone damage. This was somewhat compensated for by its superior c.c.s. figures. Trojan, Q.57 and P.O.J.2961 yielded comparably, P.O.J.2961 being at a slight disadvantage in regard to sugar per acre. Badila and S.J.16 were significantly outyielded by the other varieties.

Good growing conditions prevailed throughout the second ratoon crop and at the time of harvest only the Badila and S.J.16 plots were erect. Lodging was severe in the P.O.J.2961 plots, less so in the Trojan and Pindar, and occurring in only one of the Q.57 plots. Pindar produced the most sugar per acre, while Q.57 and Trojan were significantly superior to P.O.J.2961, Badila and S.J.16.

In the aggregate of the three crops the leading varieties were Pindar, Q.57 and Trojan, with Pindar showing to advantage in sugar per acre.

H. T. ROGERS, Pleystowe.

Soil type: Sandy forest loam. **Nature of crop:** Plant.
Age of crop: 13 months. **Harvested:** September, 1955.

SUMMARY OF CROP YIELDS

Variety	Cane per acre	c.c.s. in cane	Sugar per acre
	Tons	Per cent.	Tons
J.127	27.40	17.30	4.74
Q.50	25.20	16.60	4.16
Q.56	25.27	16.33	4.12
J.125 (Q.63)	21.33	19.07	4.06
H.106	19.89	17.65	3.50
Q.58	19.08	16.70	3.16
I.162	17.83	16.51	2.94
I.126	16.51	15.44	2.54

DISCUSSION, H. T. Rogers

Excellent tilth and good soil moisture were present when planting this trial. J.125, J.127 and Q.56 gave rapid germinations, H.106 and Q.50 were quite good, while I.126, I.162 and Q.58 were the slowest to strike. An inspection of the trial in November, 1954, revealed that portion of the trial was not progressing favourably and a potash deficiency was found to exist in this portion. Although potash was applied to the trial area, plot weights from the poor section were light at harvest. A cyclone in March, 1955, also, caused damage to all varieties and particularly H.106, J.125, J.127, Q.56 and Q.58.

The harvest results should therefore be regarded with caution and a more accurate estimation of the varieties may be made when the ratoon crop is harvested. J.127 has performed reasonably well under the circumstances in producing the highest cane and sugar yields, although its performance is not significantly better than Q.50, Q.56 and J.125. Attention is also drawn to the high sugar content of the latter variety which has recently been placed on the approved list of varieties and allotted the designation Q.63.

CENTRAL SUGAR EXPERIMENT STATION, Mackay, Block A.5.

Soil type: Grey sandy to silty loam.
Nature of crop: First Ratoon.
Age of crop: 13 months.
Harvested: November, 1954.

SUMMARY OF CROP YIELDS

Variety	Plant crop		First ratoon crop		Summary	
	Cane per acre	c.c.s. in cane	Cane per acre	c.c.s in cane	Total cane per acre	Total sugar per acre
	Tons	Per cent.	Tons	Per cent.	Tons	Tons
J.132.. ..	31.74	12.32	28.74	13.60	60.48	7.83
J.128.. ..	30.11	16.74	27.42	14.87	57.53	9.13
Q.50	29.84	17.96	26.40	14.47	56.24	9.19
Q.58	29.64	18.62	31.44	16.96	61.08	10.86
J.125.. ..	29.64	18.89	27.37	17.46	57.01	10.40
J.127.. ..	28.01	18.89	22.18	14.97	50.19	8.67

DISCUSSION.

Good ratooning followed the grubbing of this trial and all varieties made satisfactory early growth. Red rot appeared in J.132 in June, 1954, and at the time of harvest this disease was present in all but the Q.58 and J.125 plots. Q.58 arrowed very slightly while the other varieties arrowed rather heavily.

At harvest Q.58 was the outstanding variety and significantly outyielded all but J.125 in sugar per acre. In the aggregate of the two crops, Q.58 produced 10.86 tons of sugar per acre and was closely followed by J.125 yielding 10.4 tons sugar. J.125 was superior to Q.50 in both plant and first ratoon crops and has now been alloted a "Q" number, namely, Q.63. This variety germinates and ratoons well, has fair cover, is not susceptible to red rot and normally has good sugar, both early and late.

(To be continued)

Open Pan Sugar Mill

By J. H. BUZACOTT

In India there still exist many primitive types of sugar mills in which the juice is expressed from the sugar cane either by man-powered or oxen-powered rollers in exactly the same way as it was extracted centuries ago. There are also many large modern mills used in the production of the one and a half million tons or more of crystal sugar which India now manufactures each year. However, there are also a number of quite small factories which are very simple but which have been mechanised to some extent. These turn out both *gur,* which is a sugary preparation in block form from which the molasses has not been eliminated, and Khandsari which is the name given to raw sugar. *Gur,* also known as jaggery, is more important than sugar in the Indian economy and some four million tons of it are manufactured each year. In addition to being made from sugar cane it is also made from the juice of certain palm trees. The small factories are so numerous and their product so variable that the Indian Institute of Sugar Technology has a special Gur and Khandsari section which has devoted considerable investigational work to the improvement and standardisation of the technique used in these factories.

Whilst at Lucknow during March, 1955, the writer had an opportunity of visiting one of the small mills whilst it was in operation. The cane is delivered to the mill by ox-cart (Fig. 21, pictorial page), and it is crushed in a small set of rollers not much larger than those used for sampling cane at our Sugar Experiment Stations and driven by an electric motor. An average size for such a crushing mill is three rollers, each 10 inches in diameter by 14 inches long. The juice is limed and treated with sulphur, subsided and the clear juice led to heated concentrating pans. The muddy juice is filtered through bags and eventually passes to the same pans, after which it is relimed and the whole lot discharged into the final boiling pans which are set in the concrete floor of the factory and heated from below. There are three of these pans and after concentration in the first the juice is ladled into the second pan and after further concentration there it is ladled to the third pan where it is boiled to the "strike" degree (Fig. 22, pictorial page). This stage is judged by expert workmen and when it is reached the juice is ladled into trays for setting if *gur* is required. If sugar is desired it is passed on to crystallizers from which it eventually goes to a battery of five or six small centrifugals which are belt-driven from a motor-driven countershaft. The sugar prepared in this way compares very favourably with raw sugar of Queensland mills although it may vary considerably from batch to batch. It is surprising the amount of sugar turned out by these small mills considering the limitations imposed by the tiny crushing plant and the boiling pans which are no larger than shallow laundry coppers.

An approximate idea of the cost of building and operating such a mill has been issued by the Indian Institute of Sugar Technology and is as follows:—

Capital cost of mill	£6,818
Working expenses per year, including purchase of cane	£8,400
Receipts from sale of sugar and molasses	£9,400
Profit per year	£1,000

These figures are given in Australian pounds and it is worthy of note that included in the expenses are the salaries and wages of some fifty men employed which only amount to £1,500 for the season. These figures are based on a crushing of approximately 20 tons per day or 2,000 tons in a 100-day season.

Australian Tractor Testing Committee*

REPORT ON TEST No. 26 (Farmers' Edition)

McCormick International Super AWD 6 (Diesel)

(Tested for the International Harvester Co. of Australia, Geelong)

This Report is taken from the full Technical Report No. 26 of this test; test results are shown here in briefer form: fuller explanations are added. Values quoted here may be rounded out to two instead of three significant figures; to this extent the values quoted may differ slightly but not significantly from those shown in the Technical Report. Graphs of belt test performance, shown in the Technical Report, are not shown here. The Technical Report is not available in large numbers, but may be seen at the offices of the State Departments of Agriculture, the Bureau of Sugar Experiment Stations (Queensland), and the Commonwealth Department of Primary Industry.

1. THE TESTS

(1) After twelve hours of running-in, two types of tests were carried out, in order to measure *the performance of the engine*, as measured by the power in the belt driven by the belt pulley, and *the performance of the tractor as a whole*, as measured by draw-bar pull, tractor speed, wheel slip, and drawbar horsepower (d.b.h.p.), with the tractor running on a bitumen test track.

The main results of these tests are given in Sections 2, 3, and 4. Other measurements and observations were made of various features of the tractor; these are given in Section 5.

(2) FUEL MIXTURE SETTINGS.—The engine of this tractor has only one fuel-mixture setting, at which all the tests were carried out.

(3) GOVERNOR CONTROL—The engine was under the control of the governor set to give maximum power and full throttle at rated engine speed.

(4) FUEL—Distillate, Diesel Index 53, Specific Gravity, 0.84; weight per Imperial gallon, 8.41 lb.

(5) SPECIFICATION—Engine No. AD 264 2636. For a brief specification of this tractor see Section 6 at the end of this report.

2. SUMMARY OF POWER OUTPUT

Table A

	At the Belt	At the Drawbar
Rated engine speed, r.p.m.	1,450	1,450
Corrected maximum power (*a*) ..	47.6	42.9
Rated power (*b*) ..	40.5 (*b*1)	32.2 (*b*2)

NOTE—Letters in brackets refer to explanatory footnotes, p. 32.

3. BELT TESTS

The belt tests (Table B†) show the power (belt horsepower, b.h.p.) that the tractor may be expected to deliver when driving a machine by the belt.

4. DRAWBAR TESTS

(1) The following Tables C, D, and E, show the drawbar performance of the tractor, on the bitumen test track, wearing rear tyres 14 x 30, carrying maximum weight (2,350 lb. front, 6,090 lb. rear; total 8,440 lb.), working in the gears named in the tables. Height of drawbar 16 inches.

Drawbar tests, using standard and minimum weights of tractor, were carried out, but are not reported here.

*The Australian Tractor Testing Committee is a joint body established by agreement between the Commonwealth, the States of New South Wales, Victoria, South Australia, Western Australia and Tasmania, the Sugar Experiment Stations Board of Queensland, and the University of Melbourne; under this agreement, the tests are carried out by the University of Melbourne. The address of the Tractor Testing Committee is: C/o. Department of Primary Industry, 301 Flinders-lane, Melbourne.—Ed.

†If there is only one fuel setting, no mention will be made of mixture settings in this table.

Table B—Belt Test Results

	B.H.P.	Engine Speed	Fuel	
			Gall./ hr. (*c*)	lb./ b.h.p. hr. (*d*)
1. Rated engine speed, 1,450 r.p.m.				
2. Fast idling speed about 1,580 r.p.m.				
3. Observed maximum b.h.p. at rated speed ..	47.6	1,449	2.62	0.46
4. Corrected maximum b.h.p. rated speed (*a*) ..	47.6	No correction made for diesel engines.		
5. Calculated rated load (*b*1)	40.5			
6. Test at approximately rated load	40.6	1,484	2.25	0.47
7. Average loading under governor, (*e*)	25	1,510	1.7	0.55
8. Equivalent engine torque at full throttle ..	173 ft. lb. at maximum power and rated speed. 192 ft. lb. (maximum) at 1,050 r.p.m.			
9. Repeat of (3) above after 55 hours	No significant change.			

Table C—Maximum Power, Rated (3rd) Gear

	D.B.H.P. (*f*)	Pull lb.	Speed m.p.h.	Wheel Slip % (*g*)
1. Rated engine speed, 1,450 r.p.m.				
2. Observed maximum d.b.h.p. at rated engine speed	42.9	3,760	4.28	7
3. Corrected maximum d.b.h.p. at rated engine speed (*a*)	42.9	No correction made for diesel engines.		
4. Calculated rated load (*b*2)	32.2			

Table E—Fuel Consumption, Various Loads, Rated (3rd) Gear

Pull lb.	Speed m.p.h.	D.B.H.P.	Per cent. of Maximum d.b.h.p.	Slip %	Fuel	
					Gall./hr.	lb./ d.b.h.p. hr.
1,600	4.73	20	47	3	1.5	0.61
2,100	4.64	26	61	4	1.7	0.55
2,700*	4.53	33*	76*	5	2.0	0.52
3,400	4.40	40	93	7	2.4	0.50

* Approximately the rated drawbar load.

(2) INTERPRETATION OF DRAWBAR TESTS

(i) Drawbar tests are carried out on a hard prepared surface. Most field conditions present higher resistance to the tractor's motion, so that, in the field, the maximum drawbar pulls available in any gear will usually be less than those shown in the tables.

(ii) Wheel slip may also be greater in the field; to that extent tractor speeds in miles per hour in the field will be less than those shown in the tables.

(iii) Because of (i) and (ii) above, the drawbar horsepowers available in any gear in the field will usually be less than those shown in the tables.

Table D—Pull at Maximum d.b.h.p.

All gears, rated engine speed. See note (*h*)

Gear	D.B.H.P.	Pull lb.	Speed m.p.h.	Wheel Slip %
1	23	5,900	1.4	17
2	42	4,960	3.2	10
3	43	3,760	4.3	7
4	43	3,060	5.3	6
5	Road speed not tested			

5. OTHER OBSERVATIONS

(1) DURATION OF TEST—55 hours, including running-in.

(2) REPAIRS AND ADJUSTMENTS—None.

(3) ENGINE—

Fuel settings—one only.

Heat controls—radiator, thermostat on water by-pass.

Radiator water used—negligible.

Lubricating oil—type used, S.A.E. 20. Weight to engine, 14.9 lb.; Weight from engine after tests, 12.4 lb.

(4) TRACTOR WEIGHTS (lb.).

	Front	Rear	Total
Minimum weight, unballasted ..	2,170	4,335	6,505
Added weights	80	280	360
*Weight, as usually supplied ..	2,250	4,615	6,860
Water Ballast ..	..	920	920
Standard weight ..	2,250	5,535	7,780
Added weight ..	..	560	560
Water ballast ..	100	..	100
†Maximum weight, heaviest recommended ..	2,350	6,090	8,440

* This weight, less driver and fuel, was used in finding centre of gravity.

† Weight of tractor in drawbar tests quoted in this report.

(*a*) Corrected maximum h.p. is calculated by a suitable formula from observed maximum h.p. corrected to 60° F. and 29.92″ (sea level) barometric pressure. No correction is applied to diesel engines because there is no suitable formula; the values shown above are therefore the observed maximum powers.

(*b*) Engines are not expected to run indefinitely at full or maximum power output. But they can be expected to run continuously for some hours at *rated* output, which is less than maximum, defined as follows:—

(*b*1) Rated b.h.p. is defined as 85 per cent. of corrected maximum b.h.p.;

(*b*2) Rated d.b.h.p. is defined as 75 per cent. of corrected maximum d.b.h.p.

If there is only one fuel setting, no mention will be made of mixture settings in this table.

(*c*) Fuel consumption in gallons/hour may be a simple unit, but it has no meaning unless we also quote the corresponding h.p. output.

(*d*) This is the "specific fuel consumption", the weight of fuel consumed per unit of energy developed by the engine; the unit of energy here is the h.p.-hour, similar to the electrical "unit", the kilowatt-hour. When this figure is least the engine is giving its best economy or efficiency. It is easy to change from column (*c*) to column (*d*) in Table B, *e.g.*, as follows:—

2.62 galls./hr. while developing 47.6 h.p. means 2.62 ÷ 47.6 galls./b.h.p./hr. = 0.055 gall./b.h.p./hr.

0.055 gall./b.h.p./hr. × 8.41 lb./gallon for this fuel = 0.46 lb./b.h.p./hr., as shown in column (*d*).

(*e*) Line 7, Table B, represents the average performance one might expect from the engine while driving a variety of belt loads, from light to heavy. In terms of average fuel consumption, it means about 1⅛ gallons an hour.

(*f*) D.B.H.P. is the product of pull (lb.) and speed (m.p.h.) divided by 375.

(*g*) Wheel slip can be measured by noting that, in travelling a given distance, the back wheels make more turns when working under load than when running with no load on the drawbar. The difference in these revolution counts divided by the former count gives the slip as a ratio, which can be written as a percentage (quoted in these tables to the nearest whole number).

(*h*) These are not the maximum pulls available in the gears (*i.e.*, not the maximum sustained pulls), but the pulls at maximum d.b. power, *i.e.*, at full-throttle at rated engine speed.

(5) WHEELS AND TYRES—

Tyres	Front	Rear
Type ..	Rib	Open centre bar tread
Size ..	7.50 x 16 x 6 ply	14 x 30 x 6 ply
Pressure	36 psi. ..	12 psi.

(6) STEERING—With track widths, front 47", rear 55". Wheel base 76½".

Turning circles: Without brakes, 26' L.H., 25' R.H.; with brakes, 23' L.H., 22' R.H.

Comment: Easy to steer under load, sensitive to steering wheel.

(7) CENTRE OF GRAVITY, with tractor in standard weight less water ballast and driver—4½" above, 2' 2" forward of rear axle.

(8) DRIVER'S ACCOMMODATION — *Access to seat,* from back of tractor. *Foot-room and support,* adequate. *Comfort,* seat flexibly sprung, adjustable fore and aft. *Accessibility to controls,* clutch and brake pedals 23½" apart, centre to centre, pedal treads approximately 4" below loaded seat. Parking brake latch under right heel awkward to apply. Handling of gear lever in low gear conflicts with left leg.

(9) INSTRUMENTS—All clearly visible, band markings adequate. Indications were consistent throughout tests.

(10) INSPECTION OF ENGINE AND TRANSMISSION AFTER TEST—After testing, the tractor was partly dismantled and inspected and found to be in a satisfactory condition.

(11) INSTRUCTION BOOKS—Instructions for starting, running, and maintenance were satisfactory.

6. BRIEF SPECIFICATIONS: International Super AWD—6

(Based on Information Supplied by Manufacturers)

(1) ENGINE—No. AD264 2636. (I.H.C., Australia.)

4-stroke; 4 cylinders, vertical; crankshaft along tractor.

Bore, 4"; stroke, 5¼"; compression ratio, 16.7 : 1.

Rated speeds: Belt work, 1,450 r.p.m.; drawbar work, 1,450 r.p.m.

Fuel type: Distillate.

Fuel system: C.A.V. pump and injectors Filter, water traps and replaceable element. Tank capacity, 15 gallons.

Air Cleaner: Oil bath.

Governor: C.A.V. centrifugal.

Electrical system: 12-volt battery and generator.

Starting: Electric, Bosch glowplugs.

Cooling: Pressurised water, fan, pump and thermostat, no radiator shutters.

Exhaust: Straight-through type; I.H.C. spark arrester usually fitted.

Lubrication: Oil pump and by-pass filter.

(2) CHASSIS—

4-wheel; pneumatic tyres.

Wheel base 76½".

Track width: Front 47"; rear 55", adjustable.

Tyre sizes: Front 7.50 x 16; rear 14 x 30.

Steering Gear: Worm and gear.

Weight: Maximum weight, 8,440 lb. (see "Other Observations", section 5).

(3) BELT PULLEY—

Optional; right side, clockwise rotation.

Diameter 11"; face width 7½".

Speed (at rated engine speed), 899 r.p.m.

Belt speed (at rated engine speed), 2,590 ft./min. in accordance with overseas standards (namely, 3,100 ± 100 f.p.m.). Using 13" diameter pulley should give belt speed approximately 3,060 f.p.m.

(4) POWER TAKE-OFF—

Optional; guarded; location, centre rear.

Speed: 537 r.p.m., in accordance with overseas standards (namely, 536 ± 10 r.p.m.).

Dimensions: 6 spline, 1¾" diameter.

(5) DRAWBAR—Swinging—

Height, as tested 16", adjustable 8½" to 18".

TABLE F

Gear	Forward					Reverse
	1	2	3	4	5	
Ratio	139.6	64.8	49.9	41.2	14.8	106.5
Speed, m.p.h.	1.7	3.7	4.8	5.6	16.1	2.3

6) TRANSMISSION—Conventional gears.

Clutch: Single dry plate; 12″ dia.; pedal control.

Gear ratios and road speeds (assuming no wheel slip) on 14 x 30 tyres, at rated engine speed, as advertised. Table F.

(7) HYDRAULICS—Optional, not fitted.

(8) THREE-POINT LINKAGE—Optional, not fitted.

(9) SPARK ARRESTER—Standard but not fitted. Muffler fitted for test.

G. H. VASEY, Officer in Charge Tractor Testing.

I. T. NAYLOR, Tractor Testing Officer.
16th August, 1955. University of Melbourne.

Pioneer of the Australian Sugar Industry

The Hon. Louis Hope is rightly regarded as the founder of the Queensland sugar industry, so it is of interest to go back beyond him and meet the man who, in the first half of the last century, preached sugar in season and out and claimed to be the instructor and provider of plants to the honourable gentlemen. Thomas Alison Scott as a young man grew sugar on the family estate in Antigua, British West Indies, and later came to Australia. Details of his early years in this country are obscure but we do know that in 1834 he sent sugar from his own plantation on Brisbane Water, Hawkesbury River, to Sydney. Later he claimed a gratuity for his services in establishing the sugar industry and, after two Select Committees of the New South Wales Parliament had reported on it, he was granted the sizeable pension of £240 in 1871. He was then 95 but enjoyed the pension for ten years and died of "extreme old age" in 1881.

—C.G.H.

Random Gleanings

At the International Sugar Technologists Congress in India last January an invitation was received and accepted from Hawaii to hold the 1959 Congress in that country. The executive committee for that meeting consists of three well known sugar personalities, all of whom have visited Queensland. Dr. L. D. Baver, the incoming General Chairman, attended the Congress in this State in 1950; Dr. S. J. P. Chilton, the new General Vice-Chairman, had a look through our industry as recently as last December; and the General Secretary-Treasurer is Mr. W. W. G. Moir, who was present here at the 1950 meeting of the Society.

The cyclone gave some valuable information on the breakage resistance of many cane varieties. Pindar and Comus demonstrated their susceptibility to breakage under severe wind conditions, while Trojan and Badila showed up as canes which would lodge without appreciable snapping. Of the newer canes, Q.57 and Q.59 proved to be highly resistant to breakage and lodging, and Vidar also resisted the wind to a good degree. In the Cairns area Q.50 stood up to the cyclone very well and the broken stalks, in most localities, formed only a very small percentage of the crop. It's an ill wind that blows no one some good, and the sugar industry will derive some benefit from the assessment of wind resistance in the commercial varieties. An effort is now being made to devise a test whereby we might measure breakage resistance of a new cane without having to wait for a cyclone.

The modern tendency to decry the value of sugar as an article of diet prompts us to reproduce a few lines from "Sugar Molecule", the monthly journal of the Sugar Research Foundation—

Methuselah ate what he found on his plate,
And never, as people do now,
Did he note the amount of the calory count;
He ate it because it was chow.
He cheerfully chewed each species of food,
Unmindful of troubles or fears
Least his health might be hurt
By some fancy dessert;
And he lived over nine hundred years.

One of the unusual sights to which the delegates to the Indian Congress were treated was a demonstration of elephant ploughing. The Indian Government is attempting to popularise the use of the elephant as a farm animal and an exhibition of its ability was seen on an experiment station. Unfortunately the visitors could not gain a reliable impression of its pulling power since it was hitched to a small, two-furrow, mouldboard plough which could have been pulled quite easily by three farm horses. It was stated that the elephant was rated at about 20 H.P., but whether this was for a short term effort or for continuous work was not disclosed.

It was to be expected that the March cyclone would give rise to some unusual and abnormal happenings in cane fields. One anticipated result was that rots of various kinds might enter into the stalks which had lost their tops, or where bruising had injured the rind. But an effect not seen previously was a serious sunburning of lodged cane. Normally when cane lodges the stalks are protected by tops and trash and are not affected visibly by the sun's heat. In the cyclone the trash was blown away and tops were torn and tattered. The young and succulent stalks were left open to the sun's rays where crops were lodged, and severe burning has resulted in the exposed rind shrinking and turning dark brown. An internal reddening spread towards the centre of the stalk, and some tests in mid May—ten weeks after the cyclone—showed that the c.c.s. was four units lower than in undamaged stalks.

Droopy-top, a deficiency disease of sugar cane, keeps cropping up in odd spots. The latest occurrence is on a very sandy piece of land at Coonarr Creek, near Bundaberg. As with most growth failures associated with deficiency of one of the trace elements the response to an application of that element is nothing short of amazing. A relatively small amount of the necessary compound per acre makes the difference between a crop failure and a good stand of cane. Copper sulphate, which is generally used to counteract copper deficiency, is a relatively costly chemical and it will be interesting to see whether some cheap copper ore, such as copper pyrites, will provide the plant with a sufficiency of the missing element.

For several years the Bureau has been investigating the wilt and bean fly resistance of a large number of legumes in search of a short fallow green manure crop for the wet belt. The plant introduction section of C.S.I.R.O. supplied seed from legumes which had been collected in many parts of the world and, as a result of Bureau trials, one has been selected for seed multiplication. This variety has been named Malabar Pea. It produces a good weight of green material per acre and is less susceptible to very wet conditions than Reeves Selection, Cristaudo pea or Poona pea. The small seed supplies at present available are insufficient for marketing, but have been handed over to seed growers so that stocks may be built up to commercial quantities.

Dr. H. B. Hass, President of the Sugar Research Foundation—an organization founded to promote research into the increased use of sugar apart from foodstuffs—told the International Sugar Foundation recently of the use of sugar as a basis for the synthesis of excellent detergents. The potential world market he estimates at 3,600,000 tons of sugar, *i.e.*, approximately 10 per cent. of the present total world sugar consumption. Sugar detergents are tasteless, non-irritating and non-foaming and would be ideal, for instance, for emulsifying insecticides and fungicides. The cost is less than for detergents based on petroleum. Perhaps they will be worth incorporating in jams and sweets to prevent the tell-tale stickiness about small boys' mouths!

At a time when artificial sweeteners are a real threat to sugar consumption, particularly in the United States, Harvard University has come up with the information that in properly conducted tests involving hundreds of obese people, those continuing to use sugar did not gain weight in comparison with those who used only artificially sweetened food. It concludes with the opinion that non-caloric sweeteners are of no particular value in a reducing programme. Bad news indeed for the saccharine merchants but good for cane growers and overweights from China to Peru.

Creosote has been known for a long time as one of the cheapest and most effective wood preservatives and most farmers paint even durable timbers with it when putting up posts for fences or buildings in the belief that even such a surface application will prolong their life. Recent reports from the C.S.I.R.O., however, will come as a surprise to many. Research officers there, in experiments over more than 20 years, have found that sound timber, barked but including the sap wood, if soaked in creosote for several days so that a certain weight of the liquid is absorbed, will outlast in the ground the traditional bulky, split posts of ironbark and other recognised fencing timbers. An article elsewhere in this number of the Bulletin gives practical details.

One of the few sugar cane growing countries of the world in which ratoon stunting disease had not been reported was Brazil. The article appearing in this issue from a Brazilian Agricultural Research Institute outlines some preliminary work there which appears to confirm the presence of the disease in that country. The only large producing countries from which reports have not been received now are Argentine and Peru, but the odds are that the disease is there since it apparently occurs throughout the sugar world.

FREE SERVICES TO CANE GROWERS

The Bureau offers the following free services to *all* cane growers in Queensland:—

Soil Analysis and Fertilizer Recommendations

Your soil will be analysed by the most modern methods, and a report will be posted containing a recommendation covering the type of fertilizer required, the amount per acre, the need for lime, and other relevant information. Phone the nearest Bureau office and the soil samples will be taken as soon as possible.

Culture for Green Manure Seed

The Bureau laboratories in Brisbane will post to any cane grower sufficient fresh culture to inoculate seed of cowpeas, velvet beans, mung beans or other types being grown. Instructions for use of the culture will be enclosed. Address your request to The Director, Bureau of Sugar Experiment Stations, Brisbane, *but allow at least a week, after receipt of your letter, for the culture to be prepared and posted.*

Advice on All Phases of Cane Growing

The Bureau staff is at the service of all cane growers. They can best advise you on matters pertaining to varieties, fertilizers, diseases, pests, drainage and cultural methods. Bureau officers are available in every major cane growing district. A phone call will ensure a visit to your farm.